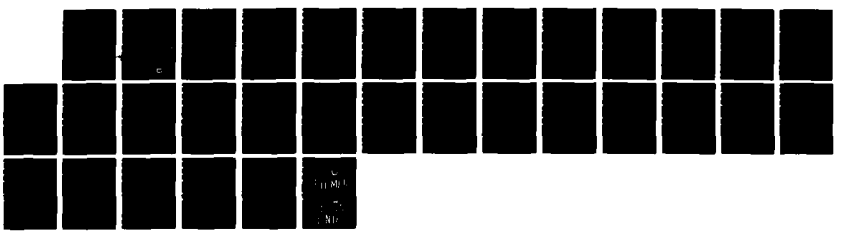
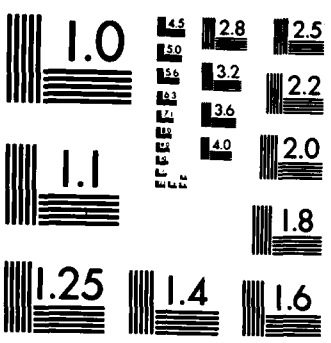
AD-A165 316 SEASONALITY AND DISTRIBUTION OF FISHES AT THE PROPOSED NORTHWARD EXTENSIO.. (U) OLD DOMINION UNIV NORFOLK VA APPLIED MARINE RESEARCH LAB R S BIRDSONG FEB 85 1/1

UNCLASSIFIED DACW65-81-C-0051 F/G 8/1 NL





(1)

Seasonality and Distribution of Fishes at the Proposed Northward Extension of the Dam Neck Disposal Site

by

Ray S. Birdsong

Applied Marine Research Laboratory
Old Dominion University
Norfolk, Virginia 23508

FEBRUARY 1985

for

The U.S. Army Corps of Engineers
Norfolk District

under
Contract No. DACW65-81-C-0051

US Army Corps Of Engineers
Norfolk District

Report B- 43

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

AD-A165 316

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release, distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S) B-43
6a. NAME OF PERFORMING ORGANIZATION Old Dominion University, Applied Marine Research Laboratory 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION U.S. Army Corps of Engineers, Norfolk District
6c. ADDRESS (City, State, and ZIP Code) Norfolk, VA 23508	7b. ADDRESS (City, State, and ZIP Code) Norfolk, Virginia 23510-1096
8a. NAME OF FUNDING/SPONSORING ORGANIZATION U.S. Army Corps of Engineers, Norfolk District 8b. OFFICE SYMBOL (If applicable) NAOPL; NAOEN	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER DACW65-81-C-0051
8c. ADDRESS (City, State, and ZIP Code) Norfolk, Virginia 23510-1096	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
Seasonality and Distribution of Fishes at the Proposed Northward Extension of the Dam Neck Disposal Site

12. PERSONAL AUTHOR(S)
Birdsong, R.S.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM _____ TO _____	1985, February	28

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Dam Neck Disposal Site, fin fish, seasonal use patterns, relative abundance, trawl sampling, gillnet sampling,

19. ABSTRACT (Continue on reverse if necessary and identify by block number)
A conclusion of this report is that, while commercial and recreational fish species do migrate through the area (DNDS and vicinity), they do not use the area to any appreciable extent for spawning.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Craig L. Seltzer	22b. TELEPHONE (Include Area Code) (804) 441-3767/827-3767 22c. OFFICE SYMBOL NAOPL-R

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

(Cont.) 18. migratory pathway, species diversity, spawning

fr. 1473

Introduction

The objectives of this study were to determine the relative abundance of fishes in the study area (Fig. 1) and to describe their seasonal use patterns. The area, extending approximately from Rudee Inlet north to near Cape Henry and from the 25 foot depth contour out to the 45 foot contour, has been proposed as a dredge material disposal site. Keywords?

> FLD 18

Methods

Trawl sampling. Trawl stations were sampled 12 times between October 1983 and October 1984. No samples were taken in December through February and 2 samples were taken in each of the months of October, April, and May. The sampling dates, along with surface salinity and temperature, are given in table 1. The sampling regime was designed to concentrate sampling during the periods of the year with the greatest amount of migratory activity by fishes.

As shown in Figure 1, the six trawl stations comprised 2 groups, one in the northern and one in the southern portion of the study area. The distribution within each group of three was approximately on the 25, 35 and 45 foot depth contours. A trawl sample consisted of one unreplicated tow, usually of about 0.5 nautical, miles using a 30 foot (9 m) otter trawl. Tow times and distances varied somewhat, however, distance towed was computed for each tow from Loran-C bearings and fish concentrations were standardized to number

A-1

per hectare.

All fishes were identified and counted. Standard length (SL) measurements to the nearest millimeter were taken on all species from each tow as follows:

1. Less than 25 individuals of a species taken - all measured.
2. More than 25 individuals of a species taken - 20 randomly selected individuals measured along with the largest and smallest as selected by eye.
3. When the catch was composed of two distinct size clasees of a species, each size class was treated separately.

Gillnet sampling. Eight gill net samples were taken between November 1983 and September 1984 at the approximate location shown in figure 1 in 25 feet of depth. A sample consisted of setting the net in the afternoon and retrieving the net the following morning. The net was 600 feet by 6 feet deep with 6.5 - 7.0 inch stretch mesh and was fished on the bottom.

Results

Table 2 shows the trawl collected fishes and squids arranged in order of frequency of occurrence in the samples. Three species, the bay anchovy (Anchoa mitchilli), the spotted hake (Urophycis regia), and the summer flounder

(Paralichthys dentatus) are ubiquitous, occuring in 86%, 85%, and 82% of the trawl samples respectively. Other species showing a high frequency of occurrence and/or high abundance were the smallmouth flounder (Etropus microstomus), the windowpane (Scophthalmus aquosus), the weakfish (Cynoscion regalis), the clearnose skate (Raja eglanteria), the spot (Leiostomus xanthurus), the butterfish (Peprilus triacanthus), the brief squid (Lolliguncula brevis), the croaker (Micropogonias undulatus), and the red hake (Urophycis chuss).

Table 3 displays gillnet catches by month. Gillnet sampling did not contribute greatly to information on abundance or seasonality of fishes in the study area due to the small catch by this gear type. However, due to the different fishing characteristics of the gillnet as compared to the trawl, several species were taken by gill net that were not seen in trawl samples. These were the sandbar shark (Carcharinus plumbeus), Atlantic sharpnose shark (Rhizoprionidon terraenovae), American shad (Alosa sapidissima), Atlantic mackerel (Scomber scombrus), and the northern stargazer (Astroscopus guttatus).

The results of the trawl collections have been organized by season, depth and north-south distribution and are summarized in tables 4 through 18. The collapse of the data into seasons was done as follows: Spring = March through May (5 sample dates); Summer = June through August (3 sampling dates); Fall = September through November (4 sampling dates).

Spring (Tables 4 - 6, 13, 14). During the spring the most abundant species in the study area was Anchoa mitchilli, especially at the stations closest to shore. Urophycis regia was common at all depths and especially common at the seaward stations where young-of-the-year (average SL = 61 mm) made up about 23% of the specimens of this species. The red hake (Urophycis chuss) was also abundant seward of the 35 foot contour. Other common species in the spring were Raja eglanteria at the inshore stations, Peprilus triacanthus at the 35 foot contour stations and, Paralichthys dentatus, Merluccius bilinearis (silver hake), and Etropus microstomus.

With the exception of Urophycis chuss which was 6 times as abundant at the northern stations, no large differences in north-south abundance were observed.

Summer (Tables 7 - 9, 15, 16). Anchoa mitchilli increased its numerical dominance in the study area especially at the near-shore stations. Leiostomus xanthurus became more common, especially at the 35 contour stations and seaward. Cynoscion regalis also showed a striking concentrations, mostly of yearling fish, at the 35 foot contour stations.

Urophycis regia remained common with increasing concentrations at the seaward stations while Raja eglentaria increased in abundance at the shoreward stations. Peprilus triacanthus became common at all stations. Along the 45 foot contour, Etropus microstomus and Lolliguncula brevis were common.

During the summer Anchoa mitchilli, Raja eglanteria,

Leiostomus xanthurus, and Cynoscion regalis were all considerably more abundant in the northern portion of the study area near the bay mouth.

Fall (Tables 10 - 12, 17, 18). While the bay achovy remained one of the most abundant species, there was a large decrease in numbers of this species at all the stations.

The Atlantic croaker (Micropogonias undulatus) became abundnat during the fall, especially along the 35 foot contour and shoreward. Two other sciaenids, Cynoscion regalis and Leiostomus xanthurus, were also abundant and the southern kingfish (Menticirrhus americanus) became common. All of these sciaenids move from the bay and inshore waters to offshore wintering grounds during the fall.

Fall brought increased concentrations of Menidia menidia (Atlantic silverside) at the shallower stations, Paralichthys dentatus at the deeper stations, and Peprilus triacanthus at and Lolliguncula brevis at all depths. Among the species which became numerous in study area only during the fall season were Anchoa hepsetus (striped anchovy), Trinectes maculatus (hogchoker), Ophidion marginatum (striped cusk-eel), Prionotus carolinus (northern searobin), Prionotus evolans (striped searobin), and Symphurus plagiusa (blackcheek toungefish).

Fish concentration at the northern stations were higher than at the southern stations for several species, most notably Micropogonias undulatus, Menidia menidia, and Anchoa mitchilli.

Discussion and Conclusions

In general the northern stations nearer the bay mouth yielded higher concentrations of most species than did the southern stations. Both diversity and overall abundance of fishes was greatest in the fall, however, some species (Anchoa mitchilli and Urophycis regia) peaked in abundance in the summer and others such as the alosines (shads) in the spring.

No information on fish concentrations in adjacent areas appears to be available except for that accumulated by the author in an allied study to this report titled "Fin Fish Seasonality and Untilization of Hampton Roads and the Entrance Channels", submitted to the U. S. Army Corps of Engineers, Norfolk District in September 1984. Data from a trawl station located in approximately 60 feet of water just north of the study area yielded results for the years 1982 and 1983 similar to those at the northern stations of the present study. Available commercial catch data are not appropriate for evaluating fish concentrations in the study area, however, a late summer and fall trawl fishery primarily directed toward flounder and weakfish does operates in the area.

The northern portion of the study area is utilized to a considerable extent by spot, croaker, and weakfish, especially during their fall migrations out of the bay. Many other species which are seasonal in bay waters also pass

through the site, however little detail is known concerning the migratory paths of fishes entering and leaving the Chesapeake Bay. The importance of the study area as a migratory pathway for fishes cannot be assessed from existing information other than to state that fishes do make some use of the area during migrations.

The study area does not appear to be used to any important extent for spawning by any of the commercial or sport species inhabiting it.

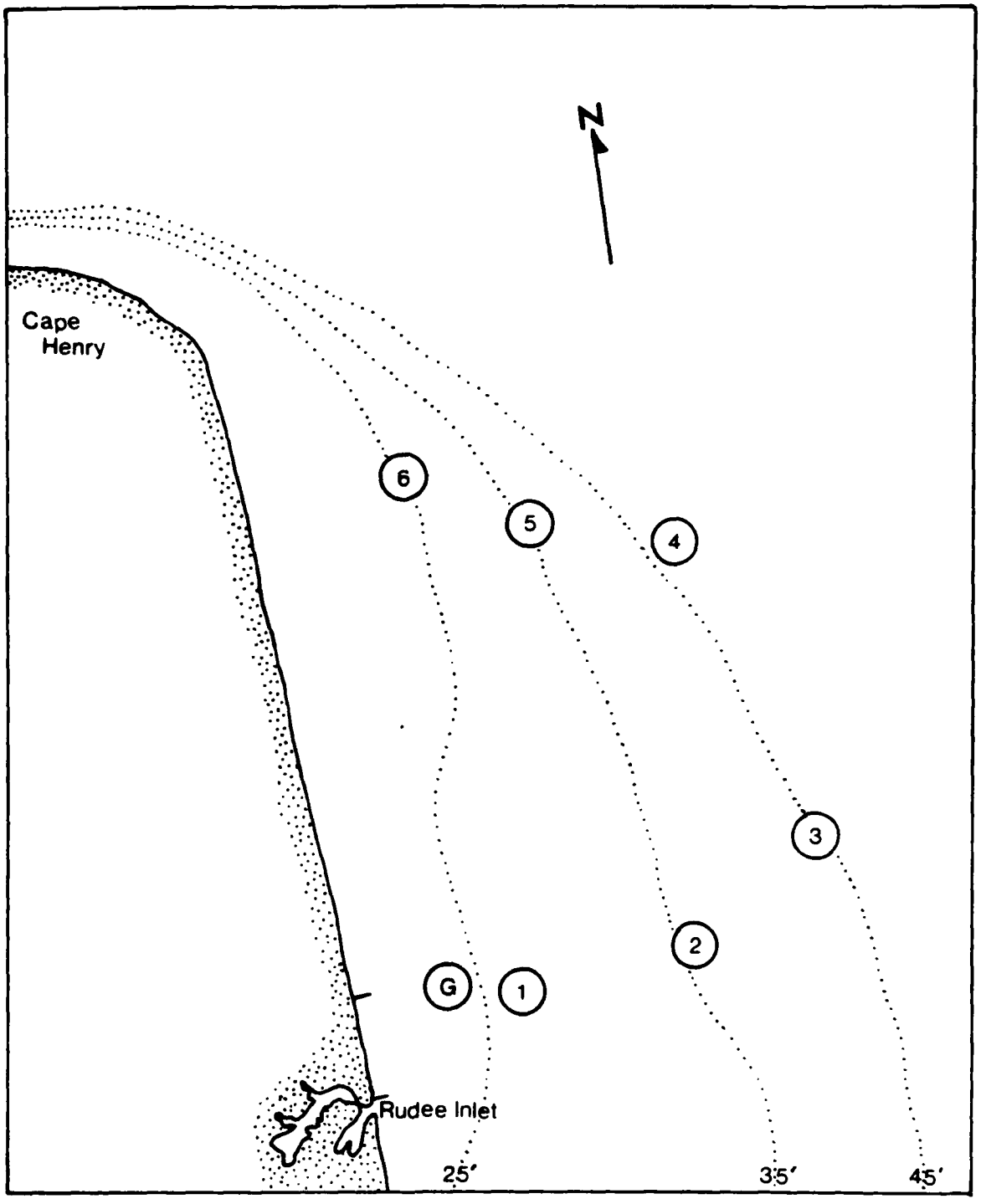


Figure 1. Map of the study area off Virginia Beach, Virginia. Trawl stations are indicated by circles 1 - 6. Circle G is the location of the gillnet station.

Table 1. Salinities and temperatures at the trawl stations.

Date	Salinity (ppt)						Temperature (C)					
	Stations						Stations					
	1	2	3	4	5	6	1	2	3	4	5	6
10-28-83	25.1	20.6	23.7	24.4	25.5	26.5	16.8	16.8	16.7	16.4	16.3	16.2
11-01-83	25.4	25.4	28.3	25.7	27.2	26.0	15.3	14.8	15.9	15.4	15.6	15.3
03-08-84	24.2	--	--	--	--	--	6.1	--	--	--	--	--
04-02-84	17.5	20.2	17.7	19.1	17.4	14.1	8.5	7.7	8.1	8.8	9.5	9.4
04-19-84	19.3	17.3	15.9	14.0	20.8	15.7	11.5	12.3	11.8	12.0	11.8	12.2
05-08-84	18.4	18.2	18.5	20.1	20.3	21.2	14.6	15.6	14.4	14.5	14.7	14.0
05-22-84	21.6	19.5	19.5	20.3	20.3	21.1	20.7	19.4	18.5	17.1	17.1	16.9
06-07-84	19.0	18.6	16.4	17.0	20.9	18.2	20.1	20.8	18.7	20.0	17.4	19.2
07-02-84	23.2	21.4	22.1	21.5	25.6	23.4	22.3	23.6	22.7	23.3	22.6	21.9
08-06-84	24.0	22.1	20.9	24.2	23.4	27.0	25.5	25.9	26.4	25.0	24.8	25.3
09-21-84	26.3	24.3	23.0	22.8	23.0	22.6	22.1	21.3	21.6	21.0	21.2	21.2
10-17-84	22.0	23.0	22.0	22.0	22.0	22.0	17.8	17.7	18.0	17.9	18.2	18.1

Table 2. Species of trawl collected fishes and squids at the proposed Dam Neck disposal site extension.

Species	Number taken	Number of occurrences
Anchoa mitchilli	37364	62
Urophycis regia	4300	61
Paralichthys dentatus	289	59
Etropus microstomus	212	47
Scophthalmus aquosus	215	46
Cynoscion regalis	2979	44
Raja eglanteria	293	42
Leiostomus xanthurus	6728	38
Peprilus triacanthus	1290	37
Lolliguncula brevis	414	37
Prionotus carolinus	301	33
Symphurus plagiusa	196	31
Micropogonias undulatus	2895	26
Menticirrhus americanus	199	25
Urophycis chuss	732	22
Merluccius bilinearis	113	21
Stenotomus chrysops	88	19
Sphoeroides maculatus	65	19
Centropristis striata	29	18
Trinectes maculatus	63	14
Pomatomus saltatrix	48	14
Prionotus evolans	80	13
Brevoortia tyrannus	30	13
Mustelus canis	18	13
Ophidion marginatum	91	11
Bairdiella chrysura	50	10
Menidia menidia	609	7
Squalus acanthias	13	7
Syngnathus fuscus	7	7
Anchoa hepsetus	79	6
Dasyatis sayi	12	6
Loligo pealei	12	6
Chaetodipterus faber	6	6
Peprilus alepidotus	22	5
Gadus morhua	11	4
Orthopristis chrysoptera	6	4
Synodus foetens	6	4
Myliobatis freminvillei	11	3
Menticirrhus saxatilis	4	3
Alosa aestivalis	9	2
Alosa pseudoharengus	6	2
Selene setapinnis	4	2
Caranx crysos	2	2
Raja erinacea	2	2
Cynoscion nebulosus	2	2
Hypsoblennius hentzi	1	1

Table 2, Cont.

Species	Number taken	Number of occurrences
Chilomycterus schoepfi	1	1
Gobiesox strumosus	1	1
Gobiosoma bosci	1	1
Gymnura micrura	1	1
Squatina dumerili	1	1
Hippocampus erectus	1	1
Eucinostomus sp.	1	1
Pollachius virens	1	1

Table 3. Individuals caught in gill net samples off Rudee Inlet.

Species	Month Caught								
	Nov 83	Mar 84	Apr 84	May 84	Jun 84	Jul 84	Aug 84	Sep 84	Total
Mustelus canis	22			26		2		1	51
Pomatomus saltatrix				1	1	1	7	34	44
Paralichthys dentatus	10			9	2	2		1	24
Carcharhinus plumbeus					3			15	18
Brevoortia tyrannus		5	3		6	1	1	1	17
Cynoscion regalis		11	1	1				1	14
Micropogonias undulatus			1		1	7	2	2	13
Alosa aestivalis		11	2						13
Urophys chuss		3	6	1					10
Peprilus triacanthus							2	7	9
Rhizoprionodon terraenovae							7	1	8
Trinectes maculatus					5	2			7
Menticirrhus spp.				2		1	1	2	6
Raja eglanteria				2	2				4
Leiostomus xanthurus							1	1	2
Scophthalmus aquosus					1	1			2
Astroscopus guttatus							1	1	2
Squatina dumerili				1					1
Synodus foetens								1	1
Scomber scombrus		1						1	2
Alosa sapidissima		1							1

Table 4. Spring trawl collections at the proposed extension of the Dam Neck disposal site along the 25 foot depth contour (stations 1 and 6). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	575.71	24	90	56
Urophycis regia	32.60	28	215	105
Raja eglanteria	5.83	388	643	565
Urophycis chuss	4.76	74	346	145
Urophycis regia (juv)	3.32	43	95	64
Scophthalmus aquosus	3.14	49	242	102
Paralichthys dentatus	2.15	158	310	209
Brevoortia tyrannus	1.16	97	296	160
Cynoscion regalis	0.98	94	179	127
Peprilus triacanthus	0.98	77	128	110
Leiostomus xanthurus	0.89	115	163	141
Etropus microstomus	0.80	38	86	68
Lolliguncula brevis	0.44			
Callinectes sapidus	0.44			
Centropristis striata	0.44	38	52	46
Merluccius bilinearis	0.35	141	184	158
Symphurus plagiusa	0.35	121	146	136
Prionotus carolinus	0.35	43	75	54
Gadus morhua	0.26	22	48	38
Squalus acanthias	0.18	805	816	810
Alosa aestivalis	0.18	67	81	74
Menticirrhus americanus	0.18	192	252	222
Sphoeroides maculatus	0.18	92	184	138
Stenotomus chrysops	0.18	74	82	78
Syngnathus fuscus	0.09	235	235	235
Micropogonias undulatus (juv)	0.09	24	24	24
Loligo pealei	0.09			
Pomatomus saltatrix	0.09	252	252	252

Table 5. Spring trawl collections at the proposed extension of the Dam Neck disposal site along the 35 foot depth contour (stations 2 and 5). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	284.87	29	89	57
Urophycis regia	37.37	36	281	106
Urophycis chuss	25.55	98	400	169
Peprilus triacanthus	5.78	37	160	103
Scophthalmus aquosus	2.48	50	219	105
Leiostomus xanthurus	2.15	112	162	145
Raja eglanteria	1.81	462	750	586
Paralichthys dentatus	1.65	150	278	188
Etropus microstomus	1.24	39	109	68
Symphurus plagiusa	0.99	51	196	136
Merluccius bilinearis	0.91	128	331	187
Brevoortia tyrannus	0.74	92	199	143
Cynoscion regalis	0.74	105	222	136
Urophycis regia (juv)	0.74	38	83	62
Alosa aestivalis	0.57	67	71	69
Prionotus carolinus	0.49	38	52	46
Peprilus triacanthus (juv)	0.41	27	35	31
Gadus morhua	0.33	34	50	38
Mustelus canis	0.33	588	1024	859
Squalus acanthias	0.24	778	953	849
Scophthalmus aquosus (juv)	0.24	49	59	52
Alosa pseudoharengus	0.24	130	156	143
Callinectes sapidus	0.24			
Stenotomus chrysops	0.24	58	78	68
Sphoeroides maculatus	0.24	82	102	89
Raja erinacea	0.16	458	468	463
Micropogonias undulatus	0.16	20	184	102
Gadus morhua (juv)	0.16	36	43	39
Centropristis striata	0.16	36	72	54
Hippocampus erectus	0.08	91	91	91
Menidia menidia	0.08	103	103	103
Squatina dumerili	0.08	750	750	750
Lolliguncula brevis	0.08			
Dasyatis sayi	0.08	905	905	905

Table 6. Spring trawl collections at the proposed extension of the Dam Neck disposal site along the 45 foot depth contour (stations 3 and 4). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Urophycis regia	63.66	26	289	108
Anchoa mitchilli	49.67	29	81	59
Urophycis chuss	30.13		456	172
Urophycis regia (juv)	29.96	32	89	59
Paralichthys dentatus	5.46	135	470	205
Merluccius bilinearis	4.30	58	382	196
Etropus microstomus	4.30	35	112	80
Scophthalmus aquosus	3.14	43	210	107
Peprilus triacanthus (juv)	2.48	22	50	32
Stenotomus chrysops	2.15	69	92	77
Lolliguncula brevis	1.57			
Raja eglanteria	1.40	430	709	575
Prionotus carolinus	1.32	31	97	51
Centropristis striata	1.15	34	243	67
Peprilus triacanthus	0.99	22	175	89
Cynoscion regalis	0.82	97	139	116
Symphurus plagiusa	0.82	69	167	132
Squalus acanthias	0.66	939	1118	1019
Sphoeroides maculatus	0.49	78	184	135
Leiostomus xanthurus	0.33	139	148	144
Callinectes sapidus	0.33			
Alosa pseudoharengus	0.24	137	188	154
Brevoortia tyrannus	0.24	191	196	193
Mustelus canis	0.24	515	833	716
Gadus morhua	0.16	32	40	36
Micropogonias undulatus	0.16	21	24	22
Loligo pealei	0.16			
Hypsoblennius hentzi	0.08	56	56	56
Gobiesox strumosus	0.08	48	48	48
Pollachius virens	0.08	55	55	55
Menticirrhus americanus	0.08	210	210	210

Table 7. Summer trawl collections at the proposed extension of the Dam Neck disposal site along the 25 foot depth contour (stations 1 and 6). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	1601.17	34	78	60
Leiostomus xanthurus	38.12	92	160	121
Urophycis regia	23.28	38	198	122
Raja eglanteria	8.04	410	710	596
Peprilus triacanthus	4.02	65	196	116
Scophthalmus aquosus	3.46	102	135	114
Cynoscion regalis	2.35	138	185	163
Prionotus carolinus	2.35	48	87	67
Callinectes sapidus	1.80			
Paralichthys dentatus	1.66	185	242	210
Menticirrhus americanus	0.97	140	204	171
Lolliguncula brevis	0.55			
Dasyatis sayi	0.27	714	720	717
Pomatomus saltatrix	0.27	113	171	142
Etropus microstomus	0.13	69	69	69
Stenotomus chrysops	0.13	90	90	90
Symphurus plagiusa	0.13	161	161	161
Ophidion marginatum	0.13	196	196	196
Centropristis striata	0.13	29	29	29
Brevoortia tyrannus	0.13	172	172	172

Table 8. Summer trawl collections at the proposed extension of the Dam Neck disposal site along the 35 foot depth contour (stations 2 and 5). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	1083.21	46	110	61
Leiostomus xanthurus	275.12	62	141	109
Urophycis regia	120.13	35	225	138
Cynoscion regalis	37.23	58	312	145
Peprilus triacanthus	12.64	28	138	83
Raja eglanteria	12.08	435	715	546
Prionotus carolinus	2.81	50	168	82
Symphurus plagiusa	2.67	73	184	147
Scophthalmus aquosus	2.24	93	135	115
Etropus microstomus	1.82	35	101	62
Paralichthys dentatus	1.54	96	302	213
Ophidion marginatum	1.54	101	224	152
Lolliguncula brevis	0.98			
Myliobatis freminvillei	0.84	394	764	615
Merluccius bilinearis	0.70	68	193	107
Centropristis striata	0.42	60	79	69
Pomatomus saltatrix	0.42	105	202	146
Brevoortia tyrannus	0.42	131	160	147
Stenotomus chrysops	0.14	81	81	81
Callinectes sapidus	0.14			
Penaeus sp.	0.14			

Table 9. Summer trawl collections at the proposed extension of the Dam Neck disposal site along the 45 foot depth contour (stations 3 and 4). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	304.68	44	76	62
Urophycis regia	168.19	35	238	135
Leiostomus xanthurus	120.28	60	180	129
Prionotus carolinus	13.50	39	123	79
Lolliguncula brevis	10.09			
Peprilus triacanthus	10.37	40	136	101
Etropus microstomus	8.95	59	118	82
Scophthalmus aquosus	6.54	82	185	116
Stenotomus chrysops	5.40	48	127	75
Raja eglanteria	4.12	342	745	512
Paralichthys dentatus	2.84	185	396	230
Cynoscion regalis	1.13	135	243	201
Merluccius bilinearis	0.85	80	111	97
Callinectes sapidus	0.56			
Myliobatis freminvillei	0.56	586	688	639
Menticirrhus saxatilis	0.42	186	200	193
Anchoa hepsetus	0.28	98	105	101
Centropristis striata	0.14	66	66	66
Micropogonias undulatus	0.14	156	156	156
Syngnathus fuscus	0.14	105	105	105

Table 10. Fall trawl collections at the proposed extension of the Dam Neck disposal site along the 25 foot depth contour (stations 1 and 6). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Micropogonias undulatus	148.72	129	210	164
Cynoscion regalis	116.49	65	247	131
Anchoa mitchilli	101.09	43	89	63
Leiostomus xanthurus	96.80	57	179	124
Menidia menidia	56.65	30	86	61
Peprilus triacanthus	30.58	84	150	105
Cynoscion regalis (juv)	17.49	29	104	57
Lolliguncula brevis	17.16			
Callinectes sapidus	16.50			
Prionotus carolinus	6.38	85	119	102
Anchoa hepsetus	6.27	95	121	105
Menticirrhus americanus	5.83	27	232	118
Menticirrhus americanus (juv)	4.95	30	105	73
Bairdiella chrysura	4.40	75	141	107
Paralichthys dentatus	3.52	146	337	207
Urophycis regia	3.19	166	246	212
Symphurus plagiusa	3.19	116	198	142
Prionotus evolans	2.53	52	98	72
Trinectes maculatus	2.09	98	148	121
Peprilus alepidotus	1.98	52	80	69
Pomatomus saltatrix	1.65	142	262	177
Sphoeroides maculatus	1.32	45	61	53
Ophidion marginatum	0.77	129	195	162
Raja eglanteria	0.66	137	702	433
Peprilus triacanthus (juv)	0.66	28	40	32
Selene setapinnis	0.44	33	36	34
Scophthalmus aquosus	0.44	122	132	127
Penaeus sp.	0.44			
Mustelus canis	0.33	552	605	572
Chaetodipterus faber	0.33	46	59	54
Pomatomous saltatrix (juv)	0.33	42	69	54
Cynoscion nebulosus	0.22	211	217	214
Syngnathus fuscus	0.22	182	194	188
Etropus microstomus	0.22	73	80	76
Dasyatis sayi	0.22	468	517	492
Synodus foetens	0.22	222	263	242
Brevoortia tyrannus	0.11	112	112	112
Eucinostomus sp.	0.11	84	84	84
Menticirrhus saxatilis	0.11	233	233	233
Gymnura micrura	0.11	179	179	179
Chilomycterus schoepfi	0.11	96	96	96

Table 11. Fall trawl collections at the proposed extension of the Dam Neck disposal site along the 35 foot depth contour (stations 2 and 5). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	603.73	22	81	60
Leiostomus xanthurus	217.35	92	175	127
Micropogonias undulatus	181.93	135	204	167
Cynoscion regalis (juv)	65.13	31	186	80
Cynoscion regalis	54.44	53	295	155
Peprilus triacanthus	43.33	56	175	104
Lolliguncula brevis	8.19			
Menticirrhus americanus	6.66	40	291	109
Symphurus plagiusa	6.66	65	190	149
Ophidion marginatum	6.66	97	213	146
Prionotus evolans	6.38	42	115	65
Urophycis regia	6.25	163	295	215
Sphoeroides maculatus	4.02	36	165	74
Etropus microstomus	3.47	26	115	69
Callinectes sapidus	3.33			
Trinectes maculatus	3.19	100	160	126
Pomatomus saltatrix	2.91	91	325	183
Anchoa hepsetus	2.63	45	220	176
Paralichthys dentatus	2.50	168	365	213
Menticirrhus americanus (juv)	1.80	30	74	61
Mustelus canis	0.69	545	590	571
Prionotus carolinus	0.69	21	100	70
Bairdiella chrysura	0.55	121	183	143
Raja eglanteria	0.55	643	770	680
Urophycis chuss	0.41	60	125	84
Peprilus alepidotus	0.41	70	170	103
Scophthalmus aquosus	0.41	121	145	132
Menidia menidia	0.13	78	78	78
Orthopristis chrysoptera	0.27	136	138	137
Syngnathus fuscus	0.27	231	295	263
Peprilus triacanthus (juv)	0.27	42	44	43
Chaetodipterus faber	0.13	58	58	58
Myliobatis freminvillei	0.13	568	568	568
Caranx crysos	0.13	119	119	119
Loligo pealei	0.13			
Merluccius bilinearis	0.13	93	93	93
Penaeus sp.	0.13			

Table 12. Fall trawl collections at the proposed extension of the Dam Neck disposal site along the 45 foot depth contour (stations 3 and 4). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Leiostomus xanthurus	155.65	92	192	129
Cynoscion regalis	54.82	64	293	153
Peprilus triacanthus	48.67	89	156	111
Anchoa mitchilli	32.09	36	75	57
Micropogonias undulatus	30.35	107	218	173
Cynoscion regalis (juv)	21.52	35	162	92
Menidia menidia	12.30	51	90	75
Lolliguncula brevis	12.30			
Paralichthys dentatus	11.50	131	373	207
Prionotus carolinus	10.69	42	105	66
Symphurus plagiusa	9.76	80	176	149
Merluccius bilinearis	4.54	48	101	76
Etropus microstomus	4.27	39	110	72
Menticirrhus americanus	4.01	58	272	116
Urophycis regia	3.74	170	254	211
Ophidion marginatum	3.20	100	196	142
Trinectes maculatus	2.80	42	161	75
Stenotomus chrysops	2.27	86	145	117
Scophthalmus aquosus	2.00	132	180	151
Sphoeroides maculatus	1.73	43	223	108
Penaeus sp.	1.73			
Callinectes sapidus	1.60			
Prionotus evolans	1.47	57	201	98
Loligo pealei	1.07			
Peprilus triacanthus (juv)	1.07	26	50	36
Dasyatis sayi	0.93	450	1105	613
Raja eglanteria	0.80	550	640	597
Bairdiella chrysura	0.80	90	119	107
Orthopristis chrysoptera	0.53	143	160	153
Synodus foetens	0.53	164	261	207
Urophycis chuss	0.40	56	62	59
Mustelus canis	0.40	542	625	582
Pomatomus saltatrix	0.40	171	229	198
Centropristis striata	0.40	90	110	100
Chaetodipterus faber	0.26	76	82	79
Gobiosoma bosci	0.13	23	23	23
Syngnathus fuscus	0.13	146	146	146
Anchoa hepsetus	0.13	116	116	116
Caranx crysos	0.13	141	141	141
Peprilus alepidotus	0.13	62	62	62

Table 13. Spring trawl collections at the proposed extension of the Dam Neck disposal site along the southern stations (stations 1, 2 and 3). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	224.59	24	89	55
Urophycis regia	45.27	26	286	107
Urophycis regia (juv)	13.36	32	95	61
Urophycis chuss	6.27	68	456	159
Peprilus triacanthus (juv)	3.57	22	175	94
Paralichthys dentatus	2.86	151	470	207
Scophthalmus aquosus	2.21	46	219	121
Etropus microstomus	2.05	38	112	80
Raja eglanteria	1.62	427	750	579
Merluccius bilinearis	1.46	58	358	186
Stenotomus chrysops	1.13	58	92	75
Lolliguncula brevis	0.86			
Prionotus carolinus	0.81	31	74	47
Leiostomus xanthurus	0.70	130	162	148
Peprilus triacanthus	0.64	22	46	31
Centropristis striata	0.59	34	72	50
Cynoscion regalis	0.48	97	222	138
Callinectes sapidus	0.43			
Squalus acanthias	0.43	778	1010	883
Brevoortia tyrannus	0.37	136	199	177
Symphurus plagiusa	0.32	102	158	134
Mustelus canis	0.21	515	1024	799
Micropogonias undulatus	0.16	20	24	21
Scophthalmus aquosus	0.16	49	59	52
Loligo pealei	0.16			
Alosa aestivalis	0.10	67	81	74
Raja erinacea	0.10	458	468	463
Gadus morhua (juv)	0.10	36	43	39
Sphoeroides maculatus	0.10	175	184	179
Pollachius virens	0.05	55	55	55
Squatina dumerili	0.05	750	750	750
Menticirrhus americanus	0.05	210	210	210

Table 14. Spring trawl collections at the proposed extension of the Dam Neck disposal Site along the northern stations (stations 4, 5 and 6). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	374.75	29	90	60
Urophycis regia	44.41	28	289	106
Urophycis chuss	36.26		402	170
Urophycis regia (juv)	9.57	35	88	60
Raja eglanteria	4.40	388	700	570
Scophthalmus aquosus	3.68	43	242	93
Paralichthys dentatus	3.38	135	388	199
Merluccius bilinearis	2.37	115	382	197
Etropus microstomus	2.25	35	111	72
Leiostomus xanthurus	1.60	112	163	142
Peprilus triacanthus	1.60	77	160	112
Peprilus triacanthus (juv)	1.36	22	50	32
Cynoscion regalis	1.24	94	179	121
Symphurus plagiusa	1.18	51	196	135
Brevoortia tyrannus	1.07	92	296	150
Prionotus carolinus	0.65	38	97	54
Centropristis striata	0.59	36	243	72
Stenotomus chrysops	0.59	69	86	79
Sphoeroides maculatus	0.53	78	184	110
Gadus morhua	0.53	22	50	38
Lolliguncula brevis	0.53			
Alosa aestivalis	0.41	67	71	69
Alosa pseudoharengus	0.35	130	188	148
Squalus acanthias	0.29	985	1118	1051
Callinectes sapidus	0.23			
Mustelus canis	0.17	588	965	795
Menticirrhus americanus	0.11	192	252	222
Micropogonias undulatus	0.05	184	184	184
Hippocampus erectus	0.05	91	91	91
Hypsoblennius hentzi	0.05	56	56	56
Gobiesox strumosus	0.05	48	48	48
Syngnathus fuscus	0.05	235	235	235
Menidia menidia	0.05	103	103	103
Micropogonias undulatus (juv)	0.05	24	24	24
Dasyatis sayi	0.05	905	905	905
Pomatomus saltatrix	0.05	252	252	252

Table 15. Summer trawl collections at the proposed extension of the Dam Neck disposal site along the southern stations (stations 1, 2 and 3). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	195.13	46	78	61
Urophycis regia	103.57	35	238	131
Leiostomus xanthurus	60.32	92	160	120
Prionotus carolinus	10.73	50	124	75
Peprilus triacanthus	8.29	28	118	71
Etropus microstomus	5.95	42	118	79
Lolliguncula brevis	5.46			
Scophthalmus aquosus	4.68	95	135	116
Stenotomus chrysops	3.61	50	127	78
Paralichthys dentatus	1.46	96	302	218
Raja eglanteria	1.17	410	690	528
Callinectes sapidus	0.78			
Merluccius bilinearis	0.58	80	101	90
Centropristis striata	0.29	60	79	69
Cynoscion regalis	0.19	149	160	154
Menticirrhus saxatilis	0.19	186	195	190
Dasyatis sayi	0.19	714	720	717
Pomatomus saltatrix	0.19	105	131	118
Symphurus plagiusa	0.09	161	161	161
Brevoortia tyrannus	0.09	150	150	150

Table 16. Summer trawl collections at the proposed extension of the Dam Neck disposal Site along the northern stations (stations 4, 5 and 6). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	1744.96	34	110	61
Leiostomus xanthurus	221.31	60	180	116
Urophycis regia	102.96	35	226	135
Cynoscion regalis	25.89	58	312	156
Raja eglanteria	14.47	342	745	550
Peprilus triacanthus	9.62	45	196	112
Scophthalmus aquosus	3.50	82	185	115
Lolliguncula brevis	2.33			
Prionotus carolinus	1.97	39	168	85
Etropus microstomus	1.43	35	105	74
Paralichthys dentatus	2.51	185	396	220
Symphurus plagiusa	1.70	73	184	147
Ophidion marginatum	1.07	101	224	156
Myliobatis freminvillei	0.89	394	764	625
Callinectes sapidus	0.89			
Menticirrhus americanus	0.62	140	204	171
Merluccius bilinearis	0.45	68	193	115
Stenotomus chrysops	0.27	48	73	56
Brevoortia tyrannus	0.27	131	172	154
Pomatomus saltatrix	0.27	113	202	162
Centropristis striata	0.18	29	66	47
Anchoa hepsetus	0.18	98	105	101
Micropogonias undulatus	0.09	156	156	156
Syngnathus fuscus	0.09	105	105	105
Menticirrhus saxatilis	0.09	200	200	200
Penaeus sp.	0.09			

Table 17. Fall trawl collections at the proposed extension of the Dam Neck disposal Site along the southern stations (stations 1, 2 and 3). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Anchoa mitchilli	337.89	34	89	62
Leiostomus xanthurus	129.51	96	192	128
Cynoscion regalis	55.75	69	295	146
Peprilus triacanthus	38.87	84	156	106
Cynoscion regalis (juv)	26.49	29	105	59
Micropogonias undulatus	23.37	123	218	174
Lolliguncula brevis	15.92			
Callinectes sapidus	6.83			
Menticirrhus americanus	6.23	36	291	109
Prionotus carolinus	6.06	42	119	94
Anchoa hepsetus	5.36	45	119	103
Menidia menidia	5.28	56	90	82
Menticirrhus americanus (juv)	3.89	30	105	73
Etropus microstomus	3.55	33	115	78
Prionotus evolans	3.46	48	201	77
Paralichthys dentatus	3.46	146	365	207
Symphurus plagiusa	3.46	80	198	146
Trinectes maculatus	3.03	42	161	99
Merluccius bilinearis	2.943	48	101	76
Sphoeroides maculatus	2.85	36	223	72
Urophycis regia	2.51	166	252	215
Ophidion marginatum	2.25	118	213	150
Peprilus triacanthus (juv)	1.38	26	50	35
Stenotomus chrysops	1.21	86	145	115
Pomatomus saltatrix	1.03	91	325	222
Penaeus sp.	0.95			
Scophthalmus aquosus	0.86	121	180	142
Peprilus alepidotus	0.86	52	170	77
Raja eglanteria	0.60	137	702	470
Mustelus canis	0.43	552	625	589
Bairdiella chrysura	0.43	110	183	138
Synodus foetens	0.43	164	263	225
Syngnathus fuscus	0.43	146	295	209
Dasyatis sayi	0.43	468	517	484
Loligo pealei	0.43			
Urophycis chuss	0.34	56	125	77
Chaetodipterus faber	0.26	57	59	58
Caranx crysops	0.17	119	141	130
Cynoscion nebulosus	0.08	211	211	211
Orthopristis chrysoptera	0.08	160	160	160
Gobiosoma bosci	0.08	23	23	23
Menticirrhus saxatilis	0.08	233	233	233
Gymnura micrura	0.08	179	179	179

Table 17, Cont.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Myliobatis freminvillei	0.08	568	568	568
Chilomycterus schoepfi	0.08	96	96	96
Centropristis striata	0.08	100	100	100

Table 18. Fall trawl collections at the proposed extension of the Dam Neck disposal site along the northern stations (stations 4, 5 and 6). Size to the nearest mm.

Species	Mean No. /hectare	Size		
		Min	Max	Mean
Micropogonias undulatus	214.35	107	213	162
Leiostomus xanthurus	172.94	57	175	125
Anchoa mitchilli	131.19	22	78	57
Cynoscion regalis	99.60	53	293	146
Menidia menidia	44.77	30	86	65
Peprilus triacanthus	41.33	56	175	106
Cynoscion regalis (juv)	39.53	32	186	91
Lolliguncula brevis	10.06			
Symphurus plagiusa	9.00	65	177	148
Callinectes sapidus	8.75			
Paralichthys dentatus	7.85	131	373	209
Urophycis regia	5.97	163	295	212
Prionotus carolinus	5.97	21	72	60
Menticirrhus americanus	4.82	27	272	120
Ophidion marginatum	4.33	97	210	144
Prionotus evolans	3.27	42	98	67
Bairdiella chrysura	3.68	75	141	107
Trinectes maculatus	2.29	52	160	119
Pomatomus saltatrix	2.21	142	228	164
Sphoeroides maculatus	1.71	45	158	85
Etropus microstomus	1.47	26	87	55
Anchoa hepsetus	1.22	105	220	199
Menticirrhus americanus (juv)	1.06	30	74	61
Peprilus alepidotus	0.98	62	80	70
Scophthalmus aquosus	0.98	122	168	145
Raja eglanteria	0.73	550	770	623
Penaeus sp.	0.57			
Mustelus canis	0.49	542	590	563
Orthopristis chrysoptera	0.40	136	159	145
Selene setapinnis	0.32	33	36	34
Dasyatis sayi	0.32	450	1105	714
Loligo pealei	0.32			
Chaetodipterus faber	0.24	46	82	68
Stenotomus chrysops	0.24	103	142	126
Pomatomous saltatrix	0.24	42	69	54
Centropristis striata	0.16	90	110	100
Urophycis chuss	0.16	61	62	61
Cynoscion nebulosus	0.08	217	217	217
Brevoortia tyrannus	0.08	112	112	112
Eucinostomus sp.	0.08	84	84	84
Synodus foetens	0.08	190	190	190
Merluccius bilinearis	0.08	93	93	93

DTIC

FILMED

4-86

END